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10/725,795	12/02/2003	Chieh Ou-Yang	35194US1	3335

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EXAMINER	
JOLLEY, KIRSTEN	
ART UNIT	PAPER NUMBER
1792	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/725,795	OU-YANG, CHIEH	
	Examiner	Art Unit	
	Kirsten C. Jolley	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 April 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5-10,12 and 13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-10,12 and 13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendments/Arguments

1. Applicant's arguments filed April 1, 2008 have been fully considered but they are not persuasive.

With respect to the rejections over Shirley, the Examiner maintains that it would have been obvious to have incorporated the features of the chill plate into the coater bowl assembly as stated in col. 5, lines 10-15, and as discussed in the prior Office actions. Applicant again argues that this quoted section does not imply that the manifold/nozzle/orifice arrangement in the coater bowl assembly 30 can be relocated above the substrate 70 instead of below it, but rather merely describes an alternative to the first embodiment described in the previous paragraph where a plurality of heat exchangers and manifolds are used instead of a single heat exchanger and manifold. The Examiner disagrees. Column 5, lines 10-14 state that "the bowl temperature controller 50b can include a plurality of heat exchangers 52b and manifolds 54b, arranged in a manner generally similar to that discussed above with reference to the *plate temperature controller 50a*" [emphasis added]. The preceding paragraph discusses bowl temperature controller 50b, not plate temperature controller 50a. While this passage does disclose use of a plurality of heat exchangers and manifolds, it also teaches that the arrangement may be similar to that of plate temperature controller 50a. Thus it is the Examiner's position that the cited section indicates that any of the discussed features of the plate temperature controller 50a, including the location of the manifold, orifices, etc., may be incorporated into the bowl temperature controller 50b.

Applicant argues that the liquid nozzle 35 in Shirley cannot be readily moved or "adjusted" as the Examiner suggests because this would displace the liquid nozzle 35 and result in non-uniform coverage of the liquid on the spinning substrate and ineffective radial temperature gradient. Applicant further states that while it may be 'possible' to reconstruct Shirley's structure to enable a radially uniform temperature gradient and central application of the liquid, Shirley does not teach one how to achieve this orc render obvious how to do so. First, it is not the Examiner's intention to modify the Shirley reference such that liquid is applied other than at the rotation center of the substrate. The Examiner notes that Shirley discloses the general inventive concept of providing a temperature gradient using heated of cooled gas from positions located above the surface of the substrate. The Examiner maintains the position that it would have been within the skill of an engineer having ordinary skill in the art to have determined an appropriate configuration of its device such that the radial gas jets are located above the substrate in combination with the nozzle at the center. For example, the manifold may be constructed such that the nozzle fits in the center of radial gas jets. A suitable configuration would be determined by an engineer in the art, having already known the general inventive concept taught by Shirley and having recognized that some adjustments to the specific construction of the apparatus would be required when incorporating the alternative suggested embodiments of Shirley.

With respect to the rejections over Kim et al. in view of Thakur, Applicant argues that the lamps in Thakur would not be effective to induce a "locally selective temperature gradient" as claimed because lamps 24, 26 appear to be standard visible-light lamps and would flood the substrate with EM energy in an uncontrolled way that would not be effective to generate a

temperature gradient. The Examiner disagrees. Thakur teaches in col. 8, lines 8-19, that "the energy emitted by the lamps can be easily and precisely controlled and varied" and that light energy can be instantaneously increased. Light energy may be used to apply a gradient of temperatures by using higher wattages or supplying more power to some light sources than others, for example. Further it is noted that Thakur discloses using similar types of EM sources as those disclosed by Applicant, therefore they must necessarily be capable of providing a temperature gradient.

With respect to the combination of Thakur and Kim, Applicant argues that they are entirely different processes that are incompatible since Thakur deposits via atomized droplets while Kim deposits liquid that is spread by centrifugal forces. It is the Examiner's position that, regardless of the means used to apply the liquid on to the substrate, Kim and Thakur similarly disclose the use of electromagnetic radiation to heat a semiconductor substrate. Kim suggests use of electromagnetic radiation to provide a temperature gradient, but does not provide specific examples. The Kim reference is modified by including the means for providing electromagnetic radiation to a semiconductor substrate taught by Thakur.

Applicant also argues that Thakur distinguishes a spincoating technique as inferior, and thus it would not have been obvious to incorporate such a technique into the process using Thakur's lamps 24,26 to mediate radial spreading of a viscous liquid. Again, the Examiner notes that the Thakur reference is merely used to demonstrate means for providing electromagnetic radiation to a semiconductor substrate, as generally taught by the Kim reference. Kim et al. mentions that other electromagnetic waves may be used to provide the temperature gradient (col. 5, lines 45-46) but does not provide any specific details. One having ordinary skill in the art

would have been motivated to look to the prior art to find alternative means of applying electromagnetic radiation in a semiconductor coating process; Thakur discloses such a process. (Further it is noted that Thakur teaches use of rotation to spread its coating liquid in col. 6, lines 14-24.)

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 is vague and indefinite because it depends from claim 4, which has been cancelled.

Claim Rejections - 35 USC § 102/103

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

> such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1 and 6-8 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Shirley (US 6,322,626).

Shirley is applied for its teachings discussed above in section 3 and in the previous Office actions. Independent claim 1 requires that the coating liquid already applied on the substrate is conditioned thermally. Shirley teaches, with respect to the chill plate section of the apparatus, that orifices 55a which apply heated or cooled gas can be positioned proximate tot the front (upper) side of the substrate 72 rather than the back side 71. In col. 5, lines 10-14, Shirley teaches that the bowl temperature controller of the coating assembly can include a plurality of heat exchangers and manifolds arranged in a manner "generally similar to that discussed above with reference to the plate temperature controller 50a" of the chill plate assembly. Thus, it is the Examiner's position that Shirley teaches coating the substrate in Shirley's coater assembly using the claimed method of selective thermal conditioning by directing a stream of heated or cooled gas to the substrate from above the substrate surface.

Alternatively, it would have been obvious to one having ordinary skill in the art to have incorporated the optional embodiments of the chill plate assembly (such as positioning the orifices above the substrate rather than below the substrate) in Shirley's coater assembly, thus supplying heating or cooling during and/or after liquid application, with the expectation of similar and successful results because both Shirley's chill plate and coater assemblies have similar structures, effects, and purposes -- to similarly provide heating or cooling to selected areas of a substrate, and because Shirley specifically teaches the incorporation of the features of the chill plate assembly into the coater bowl assembly.

As to claims 6-7, Shirley teaches the use of sub-sources directed to different positions on the radius of the substrate.

As to claim 8, Shirley's substrate is supported on a rotatable support, with liquid dispensing means provided above the substrate surface. While Shirley does not illustrate the disclosed embodiment where cooling and heating means are provided above the substrate, there would necessarily be fastening means for the thermal source(s) because it is not possible for the thermal means to float unsupported above a substrate.

7. Claims 10 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirley.

As to claims 10 and 13, it would have been obvious to one having ordinary skill in the art to have provided the thermal means above the substrate on an arm because use of an arm to hold a dispenser over the top of a substrate is well known in the spin coating art, particularly since Shirley illustrates the use of an arm to hold the liquid dispenser above the substrate. Further it would have been obvious to have made the arm movable so that the substrate can be easily placed in and removed from the coater assembly. As to claim 12, it would have been obvious to have mechanically affixed the liquid dispensing means to the thermal fastening means in order to minimize and simplify the number of parts on the coater assembly.

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirley as applied to claims 1 and 8 above, and further in view of Mandal et al. (US 6,238,735) or Kim et al. (US 5,932,009).

Shirley lacks the teaching of a cover extending over the rotatable support. The Examiner notes that use of a cover over a spin coating apparatus is very well known in the art. Mandal et al. and Kim et al. are cited to demonstrate the conventionality of a cover to provide an enclosed process space. It would have been obvious for one having ordinary skill in the art to have used a cover in the spin coating apparatus of Shirley in order to insulate the process space and prevent all the cooling and/or heating gases from dissipating before they can effectively cool/heat the substrate.

9. Claims 1, 5-10, and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US 5,932,009) taken in view of Thakur (US 6,174,651).

Kim et al. discloses a method of distributing a viscous liquid over a surface of a substrate by a spin coating process comprising: placing a substrate horizontal on a support; applying a viscous liquid onto a surface of the substrate; rotating the substrate to distribute the liquid radially outwards; and conditioning the liquid on the substrate thermally to influence its viscosity locally. Kim et al. teaches using infrared radiation to locally heat the coated substrate (col. 4, lines 48-65). Kim et al. teaches that a plurality of optical cables for guiding infrared radiation may be positioned at different radial locations under the chuck (see Figure 5 and col. 5, lines 25-31). Kim et al. lacks a teaching of placing the radiation source above the surface of the substrate. However, it is noted that Kim et al. states that "In addition to the method using the infrared generator 51 and optical cable 52 for the purpose of heating the rotation chuck 113, it is possible to use other electromagnetic waves as well" (col. 5, lines 44-46).

Thakur is cited for its teaching of similarly distributing a viscous liquid over a surface of a substrate by a spin coating process and conditioning the liquid on the substrate thermally to solidify the liquid (for example by evaporation of the solvent therein - col. 7, lines 45-47). Thakur teaches and illustrates using two lamps 24, 26 which can emit optical energy by visible light which are placed above the surface of the substrate (col. 7, lines 10-23 and Figure 1A). Thakur further teaches that "As many lamps as are necessary for the process may be used and the lamps may be placed *in any suitable configuration*. The location of the lamps illustrated in the Figures is merely exemplary" [emphasis added] (col. 7, lines 61-65). Thakur also discloses "the energy emitted by the lamps can be easily and precisely controlled and varied." It would have been obvious for one having ordinary skill in the art, seeing the references of Kim et al. and Thakur in combination, to have heated the substrate and coating liquid thereon in a temperature gradient (as taught by Kim et al.) by using radiation applied from above the substrate (as taught by Thakur) in place of radiation applied from below the substrate with the expectation of similar, successful results.

As to claims 6-7, according to the method of Kim et al., the radiation is directed to multiple different positions with regard to the radius on the substrate.

As to claims 8 and 10, in Kim et al., the substrate is supported on a rotatable support, with liquid dispensing means provided above the substrate surface. Thakur illustrates the use of fastening means, including an arm, to hold the thermal sources above the substrate.

As to claim 9, both Kim et al. and Thakur illustrate the use of a cover extending over at least part of the substrate.

As to claim 13, it would have been obvious to have made the arm holding the thermal source movable so that the substrate can be easily placed in and removed from the coater assembly in the method of Kim et al. As to claim 12, it would have been obvious to have mechanically affixed the liquid dispensing means to the thermal fastening means in order to minimize and simplify the number of parts on the coater assembly.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kirsten C. Jolley whose telephone number is 571-272-1421. The examiner can normally be reached on Monday to Tuesday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kirsten C Jolley/
Primary Examiner, Art Unit 1792

kcj